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ABSTRACT

Four elements of clinical programming must be considered during development in order for a software program to be truly useful in rehabilitation: presentation of a useful task; treatment parameters selectable by clinicians; data collection/analysis; and authoring capability. These criteria govern the development of all Brain-Link Software products. The Brain-Link system features products for training auditory comprehension/auditory memory, visual perception/memory, reading/memory, and memory patterns. A Visible Speech Aid is a hardware/software package which allows visualization of tracings of pitch, amplitude and rhythm of spoken utterances. (CL)

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Contemporary Applications Of Computer Technology
Development Of Meaningful Software
In Special Education/Rehabilitation

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At the start of the decade when the microcomputer first began to find its way into classrooms and clinics, it became apparent that a 'revolution' was underway. We were promised that this new technology would revolutionize the way in which teachers taught and students learned. It would produce fundamental changes the ways in which diagnoses were reached and treatment methodologies were applied (Northern, 1986; Mills, 1986a). Now was we look back over the last few years of using microcomputers in special education and rehabilitation, we find that only some of these promises have been kept. While progress is apparent, it is clear that the current technology possesses many functional limitations which curtail its use as a revolutionary tool of rehabilitation.

In 1980 when this clinician began to experiment with the technology as a tool in aphasia rehabilitation, the 8 bit, 48K Apple II+ was state of the art. At that time there were few peripheral devices which were of particular use in rehabilitation. Over the years leading to 1986 there have been important advances in hardware development. Now 16 bit and 32 bit machines are common. A 48K microcomputer is not only passe', it is antiquated. Microcomputers with 20 or more times this memory are easily found. A wide range of peripheral devices including speech synthesizers, speech digitizers, speech recognition devices and touch screens have all become available and affordable (Mills, 1986b). However, while hardware advances have been monumental, serious limitations in the usefulness of the technology remain.

Microcomputer hardware selection is directly dependent upon <u>software</u> availability (Mills, 1986c). Without appropriate software a

system can not meet the goals the teacher or clinician has set. It is in the area of software availability that the greatest limitation remains. When rehabilitative uses of the microcomputer first began there was no software specifically designed for this application. Existing programs in general education were 'borrowed' for use in language habilitation/rehabilitation. These 'generic' programs which were developed with the normal child/adult in mind often exhibited severe limitations when used to meet the needs of the language and cognitively impaired. Very quickly the need for software which could be adapted to the needs of the handicapped became apparent. However, few clinicians and teachers possessed the programming skills needed to develop sophisticated software. As a consequence, software development companies were created specifically to develop and market software dedicated to meeting the needs of teachers and clinicians. Brain-Link Software is one such enterprise.

It cannot be denied that in the past few years a wide range of programs have been produced. However, many of the programs produced continue to exhibit the same limitations which frustrated us when we first experimented with generic software (Volin, 1986). Few of the current dedicated programs contain all of the features which are needed to make them meaningful, flexible and useful. This is a particularly frustrating situation when it is recognized that many of our dedicated programs are produced by companies begun by teachers and clinicians. Only when the software consumer, teacher or clinician, demands more of the producers will more sophisticated programming be made available. In the end it is the consumer who will determine what is produced because software companies will not expend resources to develop programs which cannot be sold.

The remainder of this presentation will discuss the four elements of clinical programming which must be considered during development if the program is to be a truly useful adjunct to rehabilitation. These criteria govern the development of all of Brain-Link Software's products. Each of several products will be demonstrated and discussed.

Cardinal Features Of Meaningful Programming:

Presentation Of A Useful Task

The single feature which makes the microcomputer so useful to us is the fact that it is not dedicated to any particular function. Merely by the selection of software and appropriate peripheral devices the machine an be made to perform as multitude of functions. The functions selected for computerization must be ones which are meaningful to the educational/rehabilitation goals of the teacher/-clinician. He/she must analyze his/her clinic/classroom situation to determine which tasks would best be administered by the microcomputer. In many clinics funds have been expended to purchase programs which are well produced but do not perform useful tasks. Such programs go unused; a waste of resources.

Some clinical tasks lend themselves well to presentation by existing microcomputers; others do not (Mills, 1986b). Attempting to present a task for which the technology is not currently appropriate may well result in failure to learn and outright rejection of the technology by the child or adult. The most obvious examples are those where tasks are dependent upon sophisticated peripheral devices. Tasks which require that the computer understand the student/patient's spoken utterances are the best examples.

The single speaker recognition of speaker dependent devices and the limited vocabularies of speaker independent devices preclude their most powerful uses. In the near future these limitations will yield, but for the present any applications made must remain within the bounds of that which the technology can accurately and reliably perform.

Clinician Selectable Treatment Parameters

Many of the current generic and clinical programs provide the clinician with little or no control over treatment parameters. The best example is the typical video game which was developed to tax the skills of those with normal perceptual and motor systems. Most of these programs do not allow the speed to be slowed, accuracy criteria reduced or input device selected to accommodate those who are limited in ability. Consequently, the brain damaged are often precluded from using such programs.

This program rigidity is also present in any generic and dedicated clinical programs. To the teacher/clinician this means that a given program may be appropriate for very few students/patients. When it is useful for an individual, its usefulness will be quickly exhausted, either through improved performance or through boredom resulting from an inability to vary the demands of the program.

The programming provided by Brain-Link supplies the teacher/-clinician with extensive control of critical treatment parameters. This control greatly extends the program's usefulness within and across individuals and can be found in most of our programs:

Treatment Parameters	Function
Response Input	Keyboard, Joystick, Koala Pad
Baseline Selection	No Reinforcers Provided
Sound On/Off	Audio Indication of 'Right/Wrong'
Text Prompting	A Text Assist in Aud. Comp. Prog.
Clock	IIe users - Response Times Delay (0-3)
	Aud. Comp. Prog.-Reduces Rate of Speech
	Vis.+Read. Rec.- 3 Memory Intervals
Response Cont. Delay On/Off	Varies Rate of Speech or Delay
	Contingent on Response Accuracy
Data Collection On/Off	Disk Stored Data Coll/Analysis
User List	Disk Stored List of 10 User Names
Task Difficulty Level	From 3-11 levels per disk

Data Collection/Analysis

It is not uncommon to find generic programs which report only 'number correct'. Even some of the dedicated programs currently available fail to report more; a few even fail to provide printed data output. While the number correct is considered to be some indication of performance, it is not sufficient for the teacher/clinician who wishes to make treatment decisions based on performance in the computer based task. Porch (1967) has demonstrated the limitations of this type of '+/-' scoring. There are many variations of error responses and degrees of correctness. Particularly when the student/patient executes programs independently, it is necessary that

extensive data be collected, analyzed and reported to aid in the clinical decision making process. Without adequate data collection the ability to document the value of much of computerized therapy becomes questionable.

Recognizing the importance of full data reporting to the clinical process, Brain-Link has aggressively developed some of the most extensive data routines currently available in clinical software. Programs produced by Brain-Link provide the following types of data to the teacher/clinician on the monitor screen or as printed output:

Patient name and Status of Treatment Parameters Selected
Date/Time Stamping (with hardware clock)
Record of Actual Stimuli Presented
Record of Actual Responses Produced
Number of Correct and Incorrect Responses
Number of Stimulus Repeats
Percent Responses (correct and incorrect)
Individual Item Response Times (with hardware clock)
Mean Response Times (correct and incorrect)
Standard Deviation of Responses (correct and incorrect)
Analysis of Visual Quadrants of Error (Visual and Reading Rec. Programs)
Statistical Summary Within and Across Treatment Trials

By offering these extensive data routines Brain-Link insures

that its program will be able to make highly significant contributions in classroom, clinical and research settings. Where students/patients function independently these data will allow appropriate and expedient clinical decision making. Where personnel resources are inadequate to meet the needs of growing caseloads, our program will allow individual attention to specific problems while addressing issues of cost accountability. We are convinced that it is in this direction that future software development must take us.

Authoring Capability

If 'Clinician Selectable Treatment Parameters' are provided they can add a great deal of flexibility to a program, thereby greatly extending its usefulness. However, this concept of flexibility can be advanced one more important step by the addition of an 'Authoring Capability'. When so equipped a teacher/clinician can edit existing stimuli and add additional stimulus files specifically geared to his/her students/patients. Authoring can be used to extend the difficulty range of the tasks available on a disk or to personalize files to meet individual needs.

The technology involved in some programs precludes the inclusion of authoring routines. Such as the case in Brain-Link's auditory comprehension series. However, where possible (Reading Recognition) Brain-Link has provided authoring which is easily learned and quickly executed.

A Demonstration Of Selected Brain-Link Products

Auditory Comprehension Programming

Brain-Link offers three programs designed for use in the training of auditory comprehension/auditory memory impairments. These are

Word Recognition (nouns), Function Recognition (verbs) and preposition Recognition (preposition concepts). All three utilize speech which is produced by speech digitization (Mountain Computer Supertalker). It is by this means that the clearest speech signal can be generated while allowing critical program manipulations such as variable rate of speech. These programs have been found to be useful in the treatment of adult language (Mills, 1982, Mills and Hoffer, 1986) and child language disorders and in cognitive rehabilitation.

Visual Perception/Memory

Our Visual Recognition program provides practice in the visual perception of colors, shapes, letters, letter pairs, letter trigrams and mirrored pairs and trigrams. Practice can be provided in a normal or memory mode. This program is useful for both children and adults where visual perception and memory are the focus of attention. Reading comprehension is not necessary for use of the program.

Reading/Memory

The name of the program Reading Recognition does not fully communicate its extensive range of applications. It is a program which is highly useful in many areas of language, and cognition with both children and adults in the home, classroom or clinic. Reading Recognition requires the user to match the central target with one of four choices located at the four corners of the screen. Items can be presented in a normal or memory mode. Often these items are words, but they may also be numbers or keyboard characters. The authoring system provided means that the applications are only limited by the clinician's imagination. The program is provided with 14 stimulus files of 20 items each. The editing routines will accommodate an additional 12 files for a total of 520 stimulus items. For

found as we address the needs of the handicapped. While the advances of recent years have been exciting and rewarding, it is clear that we have yet to realize the full potential of this technology. When consumers demand that software producers attend to the programming elements discussed in this presentation, then we will be nearer to the realization of fully applied technology.

Bibliography

Mills, R.H., Microcomputerized Auditory Comprehension Training, Proceedings Of The Clinical Aphasiology Conference, BRK Publishers: Minneapolis, 1982

Mills, R.H., Microcomputers In Aphasia Rehabilitation, In R. Chapey, (Ed.), Language Intervention Strategies In Adult Aphasia, New York: William and Wilkins, 1986.a.

Mills, R.H., Microcomputer Applications In Aphasia and Head Trauma, In J. Northern, (Ed.), Microcomputer Applications In Communication Disorders, Boston: Little Brown Publishers, 1986.c.

Mills, R.H., Peripheral Devices and the Clinical Microcomputer, In M. Grossfeld and C. Grossfeld (Eds.). Microcomputer Applications In Rehabilitation Of Communication Disorders, Rockville, Maryland: Aspen Publishers, 1986.b.

Mills, R.H., and Hoffer P.S., Computers and Caring, In R. Marshall, (Ed.), Case Studies In Aphasia Rehabilitation, Austin, Texas: ProEd Publishers, 1986.

Northern, J., (Ed.), Microcomputer Applications in Communication Disorders, Boston:Little Brown Publishers, 1986.

Porch, B.E., Porch Index of Communicative Ability (PICA). Palo Alto, California: Consulting Psychologists Press, 1967.

Volin, R.A., Considerations in the Design and Programming of Clinical Software, In M. Grossfeld and C. Grossfeld (Eds.), Microcomputer Applications in Rehabilitation of Communication Disorders. Rockville, Maryland: Aspen Publishers, 1986.

independent use sequences of several files can be assigned with a few Keystrokes. Several of the possible files are; nouns-verbs, object-color, object-function, item-price, item-weight, company-product, keyboard character logic sequences, family member-name. Full treatment parameter control and data collection are provided.

Memory Patterns

This program which is marketed by Brain-Link Software, was produced by a neuropsychologist for use in cognitive rehabilitation. The task requires the patient to match a block design which is presented on the screen. Extensive control is provided to the clinician over critical parameters, e.g., number of blocks in the design, grid size, presentation time, retention interval, acceptable number of errors. In addition it will execute in an automatic or therapist assist mode.

Visable Speech Aid

This exciting product is marketed in the United States by Brain-Link Software. Produced by a Canadian company it brings usable speech recognition/analysis technology to the teacher/clinician at an affordable price. VSA is a hardware/software package which was designed for the Apple II+/IIe. It allows a visualization of tracings of pitch, amplitude and rhythm of spoken utterances. It provides disk storage for tracings and an entertaining game format for children. It has been found useful in deaf education and in articulation, voice and fluency training. While it is entertaining and stimulating for children it is also well accepted by adults.

Brain-Link Software believes that some of the most important applications for microcomputer technology in our society are being